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CENTER DOUBLE SLIDING DOOR DEVICE FOR AN ELEVATOR

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[There are no amendments to this patent.]

Claim

A type of center double sliding door device for an elevator characterized by the fact that it has the following parts: a first sliding door and a second sliding door that slide in opposite directions with respect to each other to open/close the entrance; rope pulleys that are rotatably mounted on frame-shaped fixed members arranged at the upper edge of the aforementioned entrance at positions corresponding to the opened positions of the aforementioned first sliding door and second sliding door, respectively; a transmission rope that is an endless transmission

rope looped around the aforementioned rope pulleys and arranged along the transverse path of the aforementioned first sliding door and second sliding door; a first connecting member that has one end attached to the aforementioned first sliding door and the other end connected to the upper side or lower side of the aforementioned transmission rope; toothed-belt pulleys that are rotatably mounted on the aforementioned fixed members and are respectively arranged at a position near the center of the entrance width and at a position corresponding to the opened position of the aforementioned second sliding door; a toothed belt, which is an endless toothed belt engaged with the aforementioned toothed-belt pulleys, arranged along the transverse path of the aforementioned second sliding door and driven to move with a driving mechanism arranged on the aforementioned fixed member; and a second connecting member that has one end attached to the aforementioned second sliding door, is connected to the lower side of the aforementioned transmission rope and toothed belt when the aforementioned first connecting member is connected to the upper side of the aforementioned transmission rope, and is connected to the upper side of the aforementioned transmission rope and toothed belt when the aforementioned first connecting member is connected to the lower side of the aforementioned transmission rope.

#### Detailed explanation of the invention

##### Industrial application field

This invention pertains to a type of center double sliding door device for an elevator arranged at the entrance to the elevator. In particular, this invention pertains to the transmission mechanism of the aforementioned center double sliding door device.

##### Prior art

Figure 3 is a front view of a conventional center double sliding door device for an elevator similar to that disclosed in Japanese Kokai Utility Model Application No. Sho 58[1983]-95968. In this figure, (1) represents an entrance of an elevator; (2) represents a frame-shaped fixed member arranged on the upper edge of entrance (1); (3) represents a rail installed on fixed member (2); (4) represents a doorsill that forms the lower edge of entrance (1); (5) represents a first sliding door that has its upper suspension brackets supported by rail (3), and has its lower portion guided by doorsill (4) for transverse movement to open/close the left half of entrance (1); (6) represents a second sliding door that has a structure similar to that of said first sliding door (5) and is for opening/closing the right half of entrance (1); (7) represents toothed-belt pulleys that are rotatably mounted on fixed member (2) and are arranged at positions corresponding to the opened positions of first sliding door (5) and second sliding door (6), respectively; (8) represents an endless toothed belt engaged with toothed-belt pulley (7); and (9) represents a driving mechanism arranged on fixed member (2) and composed of motor (9a),

small toothed-belt pulley (9b) attached to the output shaft of motor (9a), large toothed-belt pulley (9c) attached to toothed-belt pulley (7) and toothed belt (9d) engaged with small toothed-belt pulley (9b) and large toothed-belt pulley (9c). (10) represents a first connecting member that has one end attached to first sliding door (5) and has the other end attached to the upper side of toothed belt (8); and (11) represents a second connecting member that has one end attached to second sliding door (6) and has the other end attached to the lower side of toothed belt (8).

With the aforementioned constitution, the conventional center double sliding door device for an elevator works as follows. When driving mechanism (9) is turned ON, the rotation of toothed-belt pulley (7) on the end of driving mechanism (9) drives toothed belt (8). Then, by means of first and second connecting members (10), (11), first and second sliding doors (5), (6) are guided on rail (3) and perform transverse movements in opposite directions with respect to each other, so as to open/close entrance (1).

#### Problems to be solved by the invention

For the aforementioned conventional center double sliding door device for an elevator, it is necessary to have a toothed belt (8) more than four times as long as the width of entrance (1). This leads an increase in manufacturing costs, and is undesirable. Also, while different elevators have entrances (1) with different widths, toothed belt (8) is nevertheless commercially available only in standard molded ring shapes. Consequently, in some cases, the distance between toothed-belt pulleys (7) may have to be longer than the desired distance corresponding to the width of entrance (1). In such a case, fixed member (2) is longer than the minimum necessary dimension, and, because of the sliding door device, the opening of the elevator shaft becomes wider. This is undesirable.

The objective of this invention is to solve the aforementioned problems of the conventional methods by providing a type of center double sliding door device for an elevator characterized by the fact that it allows use of a short toothed belt, so that the manufacturing cost is lower, and the opening dimension can be made the minimum that corresponds with the dimension of the entrance.

#### Means for solving the problems

For the center double sliding door device for an elevator in this invention, there is a toothed belt that is arranged and driven along the transverse path of the second sliding door and serves to open/close the second sliding door, and there is a transmission rope that is arranged along the transverse path of the first sliding door and second sliding door and is driven together with the toothed belt to operate the second sliding door.

## Operation

For the center double sliding door device for an elevator with the aforementioned constitution, the length of the toothed belt is only a little longer than twice the width of the entrance, and the excess length of the standard toothed belt, with respect to the desired length corresponding to the width of the entrance, can be taken up by arranging the toothed-belt pulley that is on the opposite side from the toothed-belt pulley located at the prescribed position on the side of the receptacle for the second sliding door, nearer the first sliding door with respect to the entrance width. In addition, it is easy to select for the transmission rope the minimum length corresponding to the dimension of the entrance width, and it is possible to select without waste a length for the fixed member that corresponds to the width of the entrance.

## Application example

In the following, we will examine an application example of this invention, making reference to Figures 1 and 2.

In the figures, the same part numbers are adopted as those in Figure 3. Also, (12) represents rope pulleys that are rotatably mounted on fixed members (2) and are arranged at positions corresponding to first sliding door (5) and second sliding door (6), respectively. (13) represents an endless transmission rope looped around rope pulleys (12). (14) represents toothed-belt pulleys that are rotatably mounted on fixed member (2) and are arranged coaxially with rope pulley (12) on the side of second sliding door (6) and at a position near the center of entrance (1), respectively. (15) represents a toothed belt engaged with toothed-belt pulleys (14). (9) represents a driving mechanism that has the same constitution as driving mechanism (9) in Figure 3. It has large toothed-belt pulley (9c) that is arranged coaxially with toothed-belt pulley (14) that is arranged near the center of entrance (1), and rotates together with said toothed-belt pulley. (10) represents a first connecting member that has one end attached to first sliding door (5) and has the other end gripping the upper side of transmission rope (13). (11) represents a second connecting member that has one end attached to second sliding door (6) and has the other end equipped with first holder (11a) that grips the lower side of transmission rope (13) and second holder (11b) that grips the lower side of toothed belt (15).

For the center double sliding door device for an elevator with the aforementioned constitution, transmission rope (13) is arranged along the transverse path of first sliding door (5) and second sliding door (6). Also, toothed belt (15) is arranged along the transverse path of second sliding door (6). When driving mechanism (9) is turned ON, large toothed-belt pulley (9c) and toothed-belt pulley (14) that is arranged near the center of entrance (1) are rotated, so that toothed belt (15) is driven to move, and second sliding door (6) moves transversely by means of second connecting member (11). Also, the movement of toothed belt (15) is transmitted

via second connecting member (11) to transmission rope (13), and, by means of first connecting member (10), first sliding door (5) moves transversely in the direction opposite that of second sliding door (6), and entrance (1) is opened/closed. In this constitution, the length of toothed belt (15) should be only a little over twice the width of entrance (1). Consequently, it can be manufactured at a lower cost. Also, the excess length of toothed belt (15), in standard lengths, with respect to the width of entrance (1) of toothed-belt pulley (14) can be taken up by shifting toothed-belt pulley (14), which is arranged near the center of entrance (1), toward first sliding door (5). As a result, it is possible to avoid an increase in length of fixed member (2) to match the standard length of toothed belt (15). Also, it is possible to arrange the desired dimension of transmission rope (13) to correspond to the width of entrance (1), and it is possible to make fixed member (2) the minimum possible length, eliminating waste. As a result, the cost can be reduced, and it is possible to design the smallest possible opening dimension corresponding to the width of the entrance (1) for the center double sliding door device for an elevator.

#### Effects of the invention

As explained above, according to this invention, there is a toothed belt that is arranged and driven along to the transverse path of the second sliding door and that drives the second sliding door, and there is a transmission rope that is arranged along to the transverse path of the first sliding door and second sliding door and that is driven together with the toothed belt so as to drive the first sliding door. As a result, the required length of the toothed belt can be reduced, and the excess length of standard lengths of toothed belts, with respect to the desired length corresponding to the width of the entrance, can be take up by arranging the position of the toothed-belt pulley that is arranged near the center of the entrance, and it is possible to reduce the cost and to have a smaller space occupied by the center double sliding door device for an elevator, with the minimum possible opening dimension corresponding to the width of the entrance.

#### Brief description of the figures

Figure 1 is a front view illustrating an application example of the center double sliding door device for an elevator in this invention. Figure 2 is an enlarged cross section taken across I-I in Figure 2. Figure 3 is a diagram illustrating a conventional center double sliding door device for an elevator corresponding to that shown in Figure 1.

- 1 Entrance
- 2 Fixed member
- 5 First sliding door

- 6 Second sliding door
- 9 Driving mechanism
- 10 First connecting member
- 11 Second connecting member
- 12 Rope pulley
- 13 Transmission rope
- 14 Toothed-belt pulley
- 15 Toothed belt

The same or corresponding parts are represented by the same part numbers, respectively, throughout the figures.

Figure 1

- 1 Entrance
- 2 Fixed member
- 5 First sliding door
- 6 Second sliding door
- 9 Driving mechanism
- 10 First connecting member
- 11 Second connecting member
- 12 Rope pulley
- 13 Transmission rope
- 14 Toothed-belt pulley
- 15 Toothed belt

Figure 2

Figure 3